Missouri Department of Natural Resources
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Dust Suppression on Unpaved Roads

Environmental Assistance Office technical bulletin 3/2004

Missouri has many industries that use unpaved roads, such as limestone production, construction, mining and forest products. Dust created by traffic on these roads is a common problem. Missouri air pollution control regulations prohibit dust from private roads on commercial operations from going off the property. Therefore many businesses with private unpaved roads must use some method of dust control to comply with this regulation. While unregulated, local governments with unpaved roads to maintain may also be interested in dust control treatment to reduce concerns of residents.

The fine particles in dust also contribute to holding the road surface together. Therefore, dust suppression treatments may result in lower maintenance as well as preventing complaints about off-site air quality problems caused by operations on unpaved roads.

The most common and least expensive method of road dust control is to water the surface using a water tanker truck with a spray bar whenever dust problems occur. This method may pose some challenges such as:

- The business must dedicate resources including purchasing a water truck and having a driver.
- The required water application rate to keep dust down may result in muddy conditions and ruts caused by traffic. Mud is carried onto public roads on the tires and undercarriage of the vehicles.
- A source of sufficient quantities of clean water is required. Otherwise, water has to be trucked to the site.

Several chemical treatments are available that improve on water alone as a dust control agent (also called a palliative). Salts have been used for many years to control dust, and they have the side benefit of stabilizing the road surface resulting in reduced loss of gravel from the road surface and lower maintenance requirements. The two most common salts are calcium chloride and magnesium chloride. Some studies show that magnesium chloride is more cost effective than calcium chloride. Calcium chloride comes in flakes or pellets and is mixed with water to apply with a water truck. Magnesium chloride usually comes in brine form so no mixing is required. Articles used for this technical bulletin cite application rates for calcium chloride from 0.2 to 1 gallon per square yard of road surface; and for magnesium chloride from 0.25 to 0.5 gallon per square yard. These salts have the disadvantage of being harmful to many plants and some animal life. Treatments must be carefully applied in order to avoid contaminating the environment. Both salts work by absorbing moisture from the air and the moisture wets the small particles in the gravel and keeps them out of the air. Heavy rains may leach the salt from the road resulting in loss of dust control when the road dries. Certain salt-treated surfaces may become slick during heavy rains. Salt is also corrosive to steel, but this not a problem with normal application rates. During dry spells, magnesium chloride retains dust control better than calcium chloride because of a higher affinity for moisture.

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Another treatment is an organic derivative of pulp and paper processing, lignosulfonate, also called lignin. The method of application is different from brines. It is mechanically incorporated into the gravel using the same equipment used for maintaining the road. The chemical binds the small gravel particles together and the result is less dust. It too can leach during heavy rain, but not as much as the salt treatments. Lignin-treated surfaces become slippery when wet and brittle when dry and potholes may form. The treatment retains effectiveness during dry spells.

Lignin treatment may be more expensive than the brines because it has to be incorporated into the road material. The treatment life varies for all these chemicals according to traffic and precipitation.

Other dust suppressants include polymers, vegetable oil and petroleum products. Polymers bind the small gravel particles like lignin, but do not leach. Surfaces treated with polymers may be difficult to maintain, and polymers are usually more expensive than competitive treatments. In Missouri where agriculture is a major industry, soybean oil is readily available. However, the oil oxidizes quickly and the road surface becomes brittle, causing potholes.

There are proprietary petroleum resin products on the market that are non-toxic, not water-soluble and have the benefit of stabilizing the road for reduced maintenance cost. These products are sprayed on the road surface much like the process of chip and seal on an asphalt road. The dust control/stabilizer treatments do not contain asphalt and are not harmful to the environment, according to the manufacturers.

Cutback asphalt is asphalt which has been mixed with an oil such as diesel to make the asphalt spread easier. This material is commonly known as road oil. This treatment may cost more than chemicals, but it may also last longer. Another form of asphalt is emulsified with water. For information on asphalt application, contact a paving contractor. There are some restrictions on the use of cutback asphalt in the St. Louis metro area.

Dust suppression treatments are not permanent. The chemical has to be periodically reapplied, although for the salts, subsequent treatments usually require less than the initial treatment. Calcium and magnesium chloride may need to be reapplied once or twice a season, depending on the traffic and the amount of rainfall.

To select the optimum treatment, a soil analysis should be conducted to classify the road material. Some treatments are better suited to certain types of road material (i.e. clay content or amount of fines). Before undertaking a chemical dust suppression treatment, the road surface must be in proper shape, with particular attention paid to crowning the road for good drainage. In the case of lignin, this would be done when the chemical is applied.

The department's Water Pollution Control Program does not require a permit for application of road dust suppression chemicals if the following conditions are met:

- They are not applied within 300 feet of waters that have been identified as:
  - A losing stream or water bodies listed in the Missouri Water Quality standards (10 CSR 20) as an outstanding national or state resource water.
  - A lake or reservoir used for public drinking water supplies.
  - Critical habitat for endangered species, or
  - A biocriteria reference stream.

- They are not applied within 100 feet of waters classified as L2 (major reservoir) or P (permanent flow) except for the Missouri and Mississippi rivers.
- They are not applied to a sinkhole or other direct conduit to ground water, and
- They are not applied in such a manner that the department receives a complaint, and upon investigation, finds that the dust suppressant is causing a violation of general water quality criteria.

Common sense application of these chemicals will help ensure that there are no complaints. Improper surface preparation, incorrect application and indifference to environmental concerns will cause public complaints that will result in close scrutiny of future dust suppression activity. If a stream or lake is located near the site, call the Environmental Assistance Office to find out if applying chemical should be avoided or if any other conditions may apply.

Steve Rudloff, director of the Missouri Limestone Producers Association, was very helpful in gathering information for this project, and his assistance is gratefully acknowledged. The guidance in this bulletin is extracted from several sources. More information including Web sites can be provided on request.

For More Information

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